BIOL A282: MOLECULAR BIOLOGY

Item	Value
Curriculum Committee Approval Date	11/17/2021
Top Code	040100 - Biology, General
Units	2 Total Units
Hours	36 Total Hours (Lecture Hours 36)
Total Outside of Class Hours	0
Course Credit Status	Credit: Degree Applicable (D)
Material Fee	Yes
Basic Skills	Not Basic Skills (N)
Repeatable	No
Grading Policy	Standard Letter (S)

Course Description

An introduction to molecular biology emphasizing gene structure and function. This course is designed to satisfy transfer requirements for biology majors. PREREQUISITE: BIOL A180 and CHEM A220. Transfer Credit: CSU; UC.

Course Level Student Learning Outcome(s)

1. Explain what is read in primary and secondary scientific literature with the field of molecular biology.
2. Use knowledge of the molecules and enzymes involved in the flow of genetic information to solve biological problems.
3. Understand and cite examples of the evolutionary effects on the genome and proteome of organisms due to changes in lifestyle and ecology.

Course Objectives

- 1. Describe the structure and physical properties of DNA and RNA.
- 2. Discuss nucleic acid and genetic information.
- 3. Describe DNA replication.
- 4. Describe the enzymology of transcription.
- 5. Discuss genetic engineering and eukaryotic gene structure.
- 6. Discuss protein synthesis; general back ground and the genetic code.
- 7. Describe the genetic code.
- 8. Describe transfer RNA structure and function.
- 9. Discuss synthetases, wobble, initiator tRNA.
- 10. Describe the ribosome: structure and function.
- 11. Discuss protein synthesis rate, polarities and initiation.
- 12. Describe elongation.
- 13. Discuss termination, GTP, suppression, inhibitors, eukaryotes vs. prokaryotes.
- 14. Discuss membranes and export, protein targeting.
- 15. Discuss regulation of prokaryotic gene expression, RNA polymerase-promoter interactions.
- 16. Describe the lactose operon.
- 17. Discuss the involvement of cyclic AMP in prokaryotic regulation.
- 18. Discuss attenuation and its relation to the tryptophan operon.
- 19. Describe eukaryotic chromatin structure and nuclear organization.
- 20. Discuss changes in chromatin structure associated with gene expression.
- 21. Discuss regulatory signals and factors involved in eukaryotic gene expression.
- 22. Describe tissue specific gene expression, regulation at initiation or processing.
- 23. Discuss additional levels of regulation.

Lecture Content

Structure and physical properties of DNA and RNA Nucleic acid and genetic information DNA replication The enzymology of transcription Genetic engineering and eukaryotic gene structure Protein synthesis; general back ground and the genetic code The genetic code Transfer RNA structure and function Synthetases, wobble, initiator tRNA The ribosome: structure and function Protein synthesis rate, polarities and initiation Elongation Termination, GTP, suppression, inhibitors, eukaryotes vs. prokaryotes Membranes and export, protein targeting Regulation of prokaryotic gene expression, RNA polymerase-promoter interactions The lactose operon The involvement of cyclic AMP in prokaryotic regulation Attenuation: the tryptophan operon Eukaryotic chromatin structure and nuclear organization Changes in chromatin structure associated with gene expression Regulatory signals and factors involved in eukaryotic gene expression Tissue specific gene expression, regulation at initiation or processing Additional levels of regulation

Method(s) of Instruction

- Lecture (02)

Instructional Techniques

Lecture, discussion, use of PowerPoint presentation, assignment of problem sets and scientific papers.

Reading Assignments

Students will spend 3.5 hours per week reading the textbook, reading primary scientific literature, and watch recorded lectures.

Writing Assignments

Students will spend 2 hours a week writing answers to questions regarding the primary scientific literature they read.

Out-of-class Assignments

Students will spend 3.5 hours per week completing weekly quizzes, answering review questions, and completing assignments from the website (ACHIEVE) associated with the textbook.

Demonstration of Critical Thinking

All exams and assignments have written components and students will solve problems from the textbook, supplemental book, and journal article.

Required Writing, Problem Solving, Skills Demonstration

All exams and assignments have written components and students will solve problems from the textbook, supplemental book, and journal article.

Eligible Disciplines

Biological sciences: Masters degree in any biological science OR bachelors degree in any biological science AND masters degree in biochemistry, biophysics, or marine science OR the equivalent. Masters degree required.

Textbooks Resources

1. Required Nelson, D., Cox, M.. Lehninger Principles of Biochemistry, 8th ed. Freeman, 2021